

Monsanto

Monsanto Industrial Chemicals Co.
800 N. Lindbergh Boulevard
St. Louis, Missouri 63166
(314) 694-4764

Monsanto

RECEIVED 121 1981

RECEIVED APR 27 1981

John H. Craddock
Manager,
Product and Environmental Safety

MONSANTO INDUSTRIAL CHEMICALS CO.
300 N. Lindbergh Boulevard
St. Louis, Missouri 63166
Phone: (314) 694-1000

April 24, 1981

Mr. Bill Rutledge
GENERAL ELECTRIC COMPANY
3525 Gardner Avenue
Kansas City, Missouri 64120

RECEIVED

MAY 27 1981

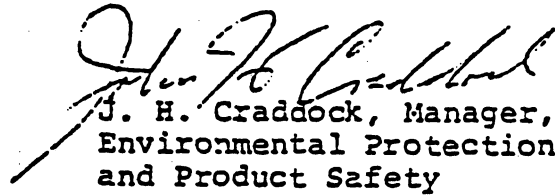
W.P. THORNTON, Jr.

Dear Mr. Rutledge:

In response to your recent request, I am enclosing a copy of a generic Material Safety Data Sheet (MSDS) for polychlorinated biphenyl (PCB) compounds. This MSDS is intended to provide general information about PCB's and does not relate to any specific formulations.

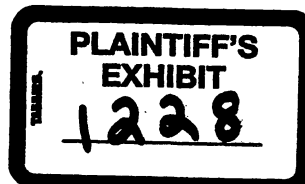
I hope this document will provide the information regarding PCB's of interest to you.

Sincerely,


J. H. Craddock, Manager,
Environmental Protection
and Product Safety

jb
enclosure

80-10a



a unit of Monsanto Company

734889

GENP 000114

NOTE:

NO REPRESENTATION IS MADE AS TO THE ACCURACY OF THE INFORMATION AND RECOMMENDATIONS HEREIN. SEE PAGE 4 FOR CONDITIONS UNDER WHICH DATA ARE FURNISHED.

MONSANTO PRODUCT NAME

POLYCHLORINATED BIPHENYLS—PCB's*

*See page 4 for definition and notes

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO. 63166
EMERGENCY PHONE NO.
(CALL COLLECT)
(314) 694-1000

PRODUCT IDENTIFICATION

Synonyms

PCB's
Chlorodiphenyl (___% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. ___% Cl)

Trade Names (Commonly used Monsanto products)

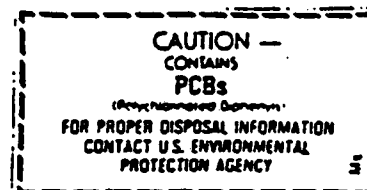
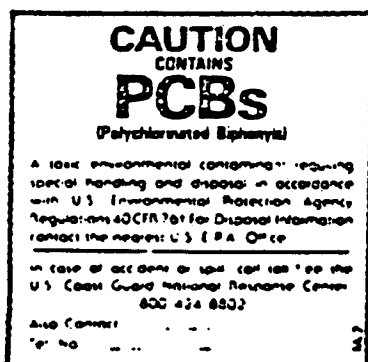
Askarel**
Aroclor[®] Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Pyranol[®] Series
Inerteen[®] Series
Therminol[®] FR Series

*See page 4 for notes

CAS No. 001336363, 053469219, 021672296, 01109769, 011096825 and others

WARNING STATEMENTS

Federal regulations under the Toxic Substances Control Act require PCB's and PCB items to be marked. (Check regulations for details.*)



EMERGENCY AND FIRST AID PROCEDURES

Ingestion—Consult a physician. Do not induce vomiting or give any oily laxatives.

NOTE TO PHYSICIAN—If large amounts ingested, gastric lavage is suggested.

Skin—If liquid or solid PCB's are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water.

NOTE TO PHYSICIAN—Hot PCB's may cause thermal burns.

Eyes—Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCB's get into them. A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCB's.

Inhalation—Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. **NOTE TO PHYSICIAN**—If electrical equipment arcs over, PCB's or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

OCCUPATIONAL CONTROL PROCEDURES

Inhalation—Workplace exposure should be maintained below the OSHA eight-hour, time-weighted average Threshold Limit Value (TLV). At room temperatures, the hazard of inhalation is considered slight or absent. Chemical cartridge respirators or gas masks approved for protection against organic vapors are recommended in the event of spills or leaks of hot fluids. These will provide good protection up to the concentrations shown on the approval labels and the odor will give ample warning if it comes through the device. Self-contained breathing apparatus should be worn when PCB's are encountered in an enclosed space.

Threshold Limit Value (TLV)—Chlorodiphenyl (42% chlorine) 1.0 mg/cu.m.
Chlorodiphenyl (54% chlorine) 0.5 mg/cu.m.

Skin Contact—Avoid prolonged or repeated skin contact. Where employees may come into direct contact with PCB's, protective clothing impervious to PCB's should be worn. Gloves, boots, overshoes and bib-type aprons that cover the boot tops should be used when necessary. This protective equipment should be regularly inspected for defects and to ensure that it is in clean and satisfactory working condition. Contaminated clothing, gloves, etc., should be disposed of as prescribed by regulations.

Eye Contact—Eye protection should be used where there is a possibility of liquid splashes.

Ingestion—Ingestion of these materials is generally not a problem in industry.

PHYSIOLOGICAL EFFECTS SUMMARY:

Skin Contact—Can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for the contracting of chloracne.

Eye Contact—The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion—The acute oral toxicities of the undiluted compounds are: LD₅₀ rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation—Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

Other—There are literature reports that PCB's can impair reproduction function in monkeys. A study reported in the literature with female rats using Aroclor® 1260 stated that Aroclor 1260 caused liver cancers. Monsanto sponsored animal feeding studies of Aroclor 1242, 1254 and 1260. These compounds, fed to both sexes of rats, did not produce cancers. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254 was not carcinogenic under the conditions of their bioassay.

The consistent finding in animal studies with PCB's is that they produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than that alleged to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

FIRE PROTECTION INFORMATION

Fire and Explosion—Chlorodiphenyls are essentially non-combustible compounds. They may decompose to form CO, CO₂, HCl, phenolics and aldehydes under severe conditions such as exposure to flame or hot surfaces. No phosgene is formed.

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chlorodiphenyls. Fire fighting equipment must be thoroughly cleaned and decontaminated after use.

PHYSICAL DATA

TABLE I—Properties of Selected Aroclors*

Property	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	—	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x-25°C	1.36-1.37	1.18-1.19	1.27-1.28	1.30-1.39	1.40-1.41	1.49-1.50	1.55-1.56
	x-25°	x-25°	x-25°	x-25°	x-65°	x-65°	x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	—	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Viscosity (100°F)	71-81	38-41	44-51	82-92	185-240	1400-2500	—

REACTIVITY DATA

PCB's are very stable, fire-resistant compounds.

SPILL, LEAK & DISPOSAL INFORMATION

If PCB's leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCB's, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCB's (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR 761).

Various federal and state regulations may require reporting of PCB spills. Consult your attorney or appropriate regulatory officials for information relating to spill reporting.

NOTE:

ALTHOUGH THE INFORMATION AND RECOMMENDATIONS SET FORTH IN THIS SHEET ARE BELIEVED TO BE CORRECT AS OF THE DATE HEREOF, MONSANTO COMPANY MAKES NO REPRESENTATION AS TO THE COMPLETENESS OR ACCURACY OF SUCH INFORMATION AND RECOMMENDATIONS. MONSANTO COMPANY SHALL IN NO EVENT BE RESPONSIBLE FOR ANY DAMAGES OF WHATSOEVER NATURE DIRECTLY OR INDIRECTLY RESULTING FROM THE PUBLICATION OR USE OF OR RELIANCE UPON SUCH INFORMATION AND RECOMMENDATIONS.

NO WARRANTY, EITHER EXPRESS OR IMPLIED, OR MERCHANTABILITY OR FITNESS OR OF ANY OTHER NATURE WITH RESPECT TO THE PRODUCT OR TO THE INFORMATION AND RECOMMENDATIONS HEREIN IS MADE HEREUNDER.

This form has been approved by the Occupational Safety and Health Administration as "equivalent to" OSHA Form 20.

*POLYCHLORINATED BIPHENYLS

For regulatory purposes, under the Toxic Substances Control Act the term "PCB's" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain 50 ppm (on a dry weight basis) or greater of such substance (40 CFR 761).

Chemically, however, PCB's are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixture generally used contains an average of 3 atoms chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives. "Federal regulations now specify that non-totally enclosed PCB activities are permitted only if specifically exempted or authorized." (40 CFR 761 see FEDERAL REGISTER, Vol. 44, P. 31514, May, 31, 1979)

CAS No. 001336363: For general class of compounds

TRADE NAMES

**ASKAREL—Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons used as dielectric fluids.

*¹ Registered trademark of Monsanto Company

*² Registered trademark of General Electric Company

*³ Registered trademark of Westinghouse Electric Corporation

This list of trade names is representative of several commonly used Monsanto products (or formulated with Monsanto products). Many other trademarked products were marketed by Monsanto and other chemical manufacturers. PCB's were also manufactured and sold by several European and Japanese producers. Contact the manufacturer of the trademarked product directly, if not in this listing, to determine if the formulation contained PCB's.

DATE September 15, 1980

REVISED

X

SUPERCEDES All prior to 9/15/80

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

John H. Craddock, Manager,
Product & Environmental Safety
Monsanto Industrial Chem. Co.
800 North Lindbergh Boulevard
St. Louis, Missouri 63166
(314) 694-4764

MONSANTO PRODUCT NAME
**Polychlorinated
Biphenyls (PCBs)**

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167
Emergency Phone No.
(Call Collect)
314-694-1000

PRODUCT IDENTIFICATION

The following materials contain 99.9% or greater PCBs. For information about other ingredients in formulations containing PCBs, contact the manufacturer of those ingredients.

Synonyms:

PCBs
Chlorodiphenyl (___% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. ___% Cl)

Trade Names

(Commonly used Monsanto products)

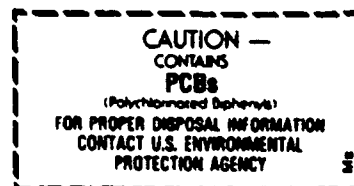
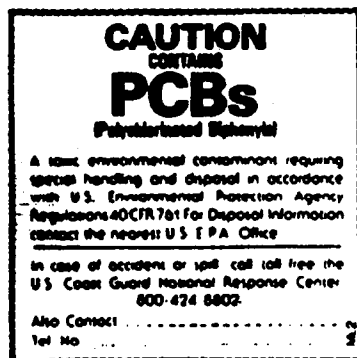
Askarel**
Aroclor[®] Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Therminol[®] FR Series

CAS No.:

001336363, 053469219, 012672296, 011097691, 011096825 and others

WARNING STATEMENTS

Federal regulations under the Toxic Substances Control Act require PCBs and PCB items to be marked. (Check regulations for details.)



PRECAUTIONARY MEASURES

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.



NEV 011379

G-404R 1-83

710631

MATERIAL SAFETY DATA

Polychlorinated Biphenyls (PCBs)

EMERGENCY AND FIRST AID PROCEDURES

Ingestion:	Consult a physician. Do not induce vomiting or give any oily laxatives. NOTE TO PHYSICIAN—If large amounts are ingested, gastric lavage is suggested.
Skin:	If liquid or solid PCBs are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water. NOTE TO PHYSICIAN—Hot PCBs may cause thermal burns.
Eyes:	Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them. A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.
Inhalation:	Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. NOTE TO PHYSICIAN—If electrical equipment arcs over, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection:	Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.
Skin Protection:	Wear appropriate protective gloves and protective clothing that provide a barrier to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wear chemical safety goggles and a face shield and a protective apron that provides a barrier when splashing is likely. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling. ATTENTION: Repeated or prolonged contact may cause chloracne in some people.
Respiratory Protection:	Avoid breathing vapor or mist. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine type equipment for given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.
Ventilation:	Provide ventilation to control exposure levels below airborne exposure limits. Use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.
Airborne Exposure Limits:	Chlorinated biphenyl (approximately 42% chlorine) OSHA PEL: 1 mg/m ³ 8-hour time-weighted average - Skin* ACGIH TLV*: 1 mg/m ³ 8-hour time-weighted average - Skin* 2 mg/m ³ short-term exposure limit - Skin* Chlorinated biphenyl (approximately 54% chlorine) OSHA PEL: 0.5 mg/m ³ 8-hour time-weighted average - Skin* ACGIH TLV*: 0.5 mg/m ³ 8-hour time-weighted average - Skin* 1 mg/m ³ short-term exposure limit - Skin*

NEV 011380

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

FIRE PROTECTION INFORMATION

Fire and

Explosion: PCBs are fire-resistant compounds. They may decompose to form CO, CO₂, HCl, phenolics, aldehydes and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

At temperatures in the range of 600-650°C in the presence of excess oxygen PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

PCBs in electrical equipment have been reported to produce both chlorinated dioxins (PCDDs) and furans (PCDFs) during fire situations. These combustion products may result all, or in part, from non-PCB components of the dielectric fluids or other combusted materials. Consult the equipment manufacturer for information regarding composition of the dielectric fluids in electrical apparatus.

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state, and local regulations.

REACTIVITY DATA

PCBs are very stable, fire-resistant compounds.

HEALTH EFFECTS SUMMARY

Skin Contact: PCBs can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for the contracting of chloracne.

Eye Contact: The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion: The acute oral toxicities of the undiluted compounds are: LD₅₀ rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation: Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

Other: There are literature reports that PCBs can impair reproductive functions in monkeys. A study reported in the literature with female rats using Aroclor® 1260 stated that Aroclor 1260 caused liver cancers. Monsanto sponsored animal feeding studies of Aroclor 1242, 1254 and 1260. These compounds, fed to both sexes of rats, did not produce cancers. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay.

(Health Effects Summary Continued On Next Page)

NEV 011381

MATERIAL SAFETY DATA

Polychlorinated Biphenyls (PCBs)

HEALTH EFFECTS SUMMARY (Continued)

The consistent finding in animal studies with PCBs is that they produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and non-worker environmentally exposed populations, have not demonstrated any statistically significant causal relationship between PCB exposures and chronic human illnesses such as cancer or neurological or cardiovascular effects. Nor was there any increase in overall cancer mortality as a result of PCB exposure. PCBs can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). The Standard requires that this document mention that PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1982)-Group 2B and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Third).

PHYSICAL DATA

Properties of Selected Aroclors®

Property	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g. maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F)	71-81	38-41	44-51	82-92	185-240	1800-2500	—

NA - Not Available

NEV 011382

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

SPILL, LEAK & DISPOSAL INFORMATION

Disposal of liquid PCBs and other PCB items is strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any disposal of PCBs, PCB items, or PCB-contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. See Occupational Control Procedures section of this MSDS.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCBs (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

Various federal, state, and local regulations may require reporting of PCB spills and may also define spill clean-up levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill clean-up.

ADDITIONAL COMMENTS

Polychlorinated Biphenyls

For regulatory purposes, under the Toxic Substances Control Act the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance (40 CFR Part 761).

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives. Federal regulations specify that non-totally enclosed PCB activities are permitted only if specifically exempted or authorized. (40 CFR Part 761).

CAS No. 001336363: For general class of compounds

(Additional Comments Continued On Next Page)

NEV 011383

MATERIAL SAFETY DATA

Polychlorinated Biphenyls (PCBs)

ADDITIONAL COMMENTS (Continued)

Trade Names/Common Names

**ASKAREL- Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30-70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs.

PYRANOL[®] and INERTEEN[®] are trademarks for commonly used dielectric fluids that may have contained varying ratios of PCBs as well as other components including chlorinated benzenes.

[®]Registered trademark of Monsanto Company

[®]Registered trademark of General Electric Company

[®]Registered trademark of Westinghouse Electric Corporation

This list of trade names is representative of several commonly used Monsanto products (or formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product directly, if not in this listing, to determine if the formulation contained PCBs and its composition.

DATE: 10/15/85
MSDS NO.: G 4048

REVISED:

SUPERSEDES: All prior to 10/15/85

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

John H. Craddock
Product & Environmental Safety Director

Robert G. Kaley, II
Product & Environmental Safety Manager

Environmental Policy Staff
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63167
(314) 694-4764

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

NEV 011384

710636

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

NEV 011385

710637

1/12 CC: TF
T. ROWE
DIM
RSF

504
RECEIVED

NOV 8 1985

S. E. HAMILTON

Monsanto

Monsanto Company
800 N. Lindbergh Boulevard
St. Louis, Missouri 63167
Phone: (314) 684-1000

November 4, 1985

Hamilton, Stephen B.
General Electric Company
3135 Easton Turnpike
Fairfield CT 06431

In response to your recent request, I am enclosing a copy of a newly revised (10/15/85) generic Material Safety Data Sheet (MSDS) for Polychlorinated Biphenyl (PCB) compounds. This MSDS conforms to the OSHA Hazard Communication Standard (29 CFR 1910.1200). This MSDS is intended to provide general information for materials containing 99.9% or greater PCBs and does not relate to any specific formulations. For information about other ingredients in formulations containing PCBs, please contact the manufacturer of those ingredients.

I hope this document will provide the information regarding PCBs, which is of interest to you.

Sincerely yours,

Robert G. Kaley, II

Robert G. Kaley, II, Ph.D.
Product & Environmental Safety Manager
Environmental Policy Staff

ve
Enc.
MSDS
85-10a



734894

GENP 000119

MONSANTO PRODUCT NAME

**Polychlorinated
Biphenyls (PCBs)**MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167Emergency Phone No.
(Call Collect)
314-694-1000**PRODUCT IDENTIFICATION**

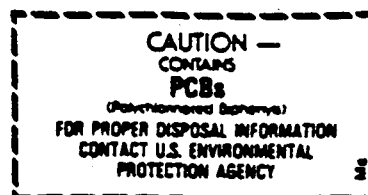
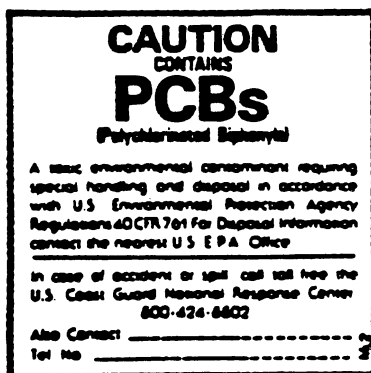
The following materials contain 99.9% or greater PCBs. For information about other ingredients in formulations containing PCBs, contact the manufacturer of those ingredients.

Synonyms:PCBs
Chlorodiphenyl (___% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. ___% Cl)**Trade Names**

(Commonly used Monsanto products)

Askarel**
Aroclor® Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Therminol® FR Series**CAS No.:**001336363, 053469219, 012672296, 011097691, 011096825 and
others**WARNING STATEMENTS**

Federal regulations under the Toxic Substances Control Act require PCBs and PCB items to be marked. (Check regulations for details.)

**PRECAUTIONARY MEASURES**

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

EMERGENCY AND FIRST AID PROCEDURES

- Ingestion:** Consult a physician. Do not induce vomiting or give any oily laxatives. NOTE TO PHYSICIAN—If large amounts are ingested, gastric lavage is suggested.
- Skin:** If liquid or solid PCBs are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water. NOTE TO PHYSICIAN—Hot PCBs may cause thermal burns.
- Eyes:** Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them. A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.
- Inhalation:** Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. NOTE TO PHYSICIAN—If electrical equipment arcs over, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

OCCUPATIONAL CONTROL PROCEDURES

- Eye Protection:** Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.
- Skin Protection:** Wear appropriate protective gloves and protective clothing that provide a barrier to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wear chemical safety goggles and a face shield and a protective apron that provides a barrier when splashing is likely. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.
- Respiratory Protection:** ATTENTION: Repeated or prolonged contact may cause chloracne in some people. Avoid breathing vapor or mist. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine type equipment for given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.
- Ventilation:** Provide ventilation to control exposure levels below airborne exposure limits. Use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.
- Airborne Exposure Limits:** Chlorinated biphenyl (approximately 42% chlorine)
- | | |
|-------------|--|
| OSHA PEL: | 1 mg/m ³ 8-hour time-weighted average - Skin* |
| ACGIH TLV®: | 1 mg/m ³ 8-hour time-weighted average - Skin* |
| | 2 mg/m ³ short-term exposure limit - Skin* |
- Chlorinated biphenyl (approximately 54% chlorine)
- | | |
|-------------|--|
| OSHA PEL: | 0.5 mg/m ³ 8-hour time-weighted average - Skin* |
| ACGIH TLV®: | 0.5 mg/m ³ 8-hour time-weighted average - Skin* |
| | 1 mg/m ³ short-term exposure limit - Skin* |

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

MATERIAL SAFETY DATA Polychlorinated Biphenyl (PCBs)

FIRE PROTECTION INFORMATION

Fire and

Explosion: PCBs are fire-resistant compounds. They may decompose to form CO, CO₂, HCl, phenolics, aldehydes and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

At temperatures in the range of 600-650°C in the presence of excess oxygen PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do *not* produce polychlorinated dibenzo-p-dioxins (PCDDs).

PCBs in electrical equipment have been reported to produce both chlorinated dioxins (PCDDs) and furans (PCDFs) during fire situations. These combustion products may result all, or in part, from non-PCB components of the dielectric fluids or other combusted materials. Consult the equipment manufacturer for information regarding composition of the dielectric fluids in electrical apparatus.

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state, and local regulations.

REACTIVITY DATA

PCBs are very stable, fire-resistant compounds.

HEALTH EFFECTS SUMMARY

Skin Contact: PCBs can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for the contracting of chloracne.

Eye Contact: The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion: The acute oral toxicities of the undiluted compounds are: LD₅₀ rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation: Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

Other: There are literature reports that PCBs can impair reproductive functions in monkeys. A study reported in the literature with female rats using Aroclor® 1260 stated that Aroclor 1260 caused liver cancers. Monsanto sponsored animal feeding studies of Aroclor 1242, 1254 and 1260. These compounds, fed to both sexes of rats, did not produce cancers. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay.

(Health Effects Summary Continued On Next Page)

734897

GENP 000122

MATERIAL SAFETY DATA

Polychlorinated Biphenyls (PCBs)

HEALTH EFFECTS SUMMARY (Continued)

The consistent finding in animal studies with PCBs is that they produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and non-worker environmentally exposed populations, have not demonstrated any statistically significant causal relationship between PCB exposures and chronic human illnesses such as cancer or neurological or cardiovascular effects. Nor was there any increase in overall cancer mortality as a result of PCB exposure. PCBs can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). The Standard requires that this document mention that PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1982)-Group 2B and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Third).

PHYSICAL DATA

Properties of Selected Aroclors*

Property	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g. maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F)	71-81	38-41	44-51	82-92	185-240	1800-2500	—

NA - Not Available

MATERIAL SAFETY DATA Polychlorinated Biphenyl (PCBs)

734898

GENP 000123

SPILL, LEAK & DISPOSAL INFORMATION

Disposal of liquid PCBs and other PCB items is strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any disposal of PCBs, PCB items, or PCB-contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. See Occupational Control Procedures section of this MSDS.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCBs (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

Various federal, state, and local regulations may require reporting of PCB spills and may also define spill clean-up levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill clean-up.

ADDITIONAL COMMENTS**Polychlorinated Biphenyls**

For regulatory purposes, under the Toxic Substances Control Act the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance (40 CFR Part 761).

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives. Federal regulations specify that non-totally enclosed PCB activities are permitted only if specifically exempted or authorized. (40 CFR Part 761).

CAS No. 001336363: For general class of compounds

(Additional Comments Continued On Next Page)

734899

MATERIAL SAFETY DATA

Polychlorinated Biphenyls (PCBs)

GENP 000124

ADDITIONAL COMMENTS (Continued)

Trade Names/Common Names

ASKAREL-Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30-70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs.

PYRANOL[®] and **INERTEEN[®]** are trademarks for commonly used dielectric fluids that may have contained varying ratios of PCBs as well as other components including chlorinated benzenes.

[®]Registered trademark of Monsanto Company

[®]Registered trademark of General Electric Company

[®]Registered trademark of Westinghouse Electric Corporation

This list of trade names is representative of several commonly used Monsanto products (or formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product directly, if not in this listing, to determine if the formulation contained PCBs and its composition.

DATE: 10/15/85
MSDS NO.: G 4048

REVISED:

SUPERSEDES: All prior to 10/15/85

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

John H. Craddock
Product & Environmental Safety Director

Robert G. Kaley, II
Product & Environmental Safety Manager

Environmental Policy Staff
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63167
(314) 694-4764

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

MATEF L SAFETY DATA Polychlorinated Biphenyls (PCBs)

Monsanto MATERIAL SAFETY DATA

Page 1 of 6

MONSANTO PRODUCT NAME
**Polychlorinated
Biphenyls (PCBs)**

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167

Emergency Phone No.
(Call Collect)
314-694-1000

Date: 10/88

PRODUCT IDENTIFICATION

Synonyms:

PCBs
Chlorodiphenyl (___% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. ___% Cl)

Trade Names/

Common Names:

Aroclor^{®1} Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Therminol^{®1} FR Series

PYRANOL^{®2} and INERTEEN^{®3} are trademarks for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL - Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30-70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

This list of trade names is representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

^{®1} Registered trademark of Monsanto Company

^{®2} Registered trademark of General Electric Company

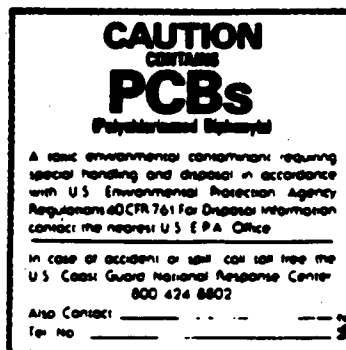
^{®3} Registered trademark of Westinghouse Electric Corporation

CAS No.'s:

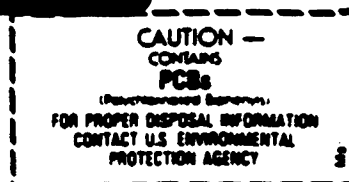
001336363, 053469219, 021672296, 01109769, 011096825 and others

WARNING STATEMENTS

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked. (check regulations, 40 CFR 761, for details)



NEV 011386



MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

Monsanto MATERIAL SAFETY DATA

Page 2 of 6

PRECAUTIONARY MEASURES

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

EMERGENCY AND FIRST AID PROCEDURES

Ingestion: Consult a physician. Do not induce vomiting or give any oily laxatives. NOTE TO PHYSICIAN—If large amounts are ingested, gastric lavage is suggested.

Skin: If liquid or solid PCBs are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water. NOTE TO PHYSICIAN—Hot PCBs may cause thermal burns.

Eyes: Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them. A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.

Inhalation: Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. NOTE TO PHYSICIAN—If electrical equipment arcs over, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection: Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

Skin Protection: Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

Respiratory Protection: **ATTENTION!** Repeated or prolonged contact may cause chloracne in some people. Avoid breathing vapor or mist. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

Airborne Exposure Limits: Chlorinated biphenyl (approximately 42% chlorine)
OSHA PEL: 1 mg/m³ 8-hour time-weighted average - Skin*
ACGIH TLV: 1 mg/m³ 8-hour time-weighted average - Skin*
2 mg/m³ short-term exposure limit - Skin*

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.
(OCCUPATIONAL CONTROL PROCEDURES continued on page 3)

Polychlorinated Biphenyls (PCBs)

MATERIAL SAFETY DATA

NEV 011387

710639

Monsanto MATERIAL SAFETY DATA

Page 3 of 6

OCCUPATIONAL CONTROL PROCEDURES (continued)

Airborne

Exposure Limits

(Continued):

Chlorinated biphenyl (approximately 54% chlorine)

OSHA PEL: 0.5 mg/m³ 8-hour time-weighted average - Skin*

ACGIH TLV: 0.5 mg/m³ 8-hour time-weighted average - Skin*

1 mg/m³ short-term exposure limit - Skin*

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

FIRE PROTECTION INFORMATION

Fire and

Explosion:

PCBs are fire-resistant compounds. They may decompose to form CO, CO₂, HCl, phenolics, aldehydes and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

At temperatures in the range of 600-650°C in the presence of excess of oxygen PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

PCBs in electrical equipment have been reported to produce both chlorinated dioxins (PCDDs) and furans (PCDFs) during fire situations. These combustion products may result all, or in part, from non-PCB components of the dielectric fluids or other combusted materials. Consult the equipment manufacturer for information regarding composition of the dielectric fluids in electrical apparatus.

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state, and local regulations.

REACTIVITY DATA

PCBs are very stable, fire-resistant compounds.

HEALTH EFFECTS SUMMARY

Skin Contact:

PCBs can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for contracting chloracne.

Eye Contact:

The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion:

The acute oral toxicities of the undiluted compounds are: LD₅₀ rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation:

Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

(HEALTH EFFECTS SUMMARY continued on page 4)

NEV 011388

710640

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

HEALTH EFFECTS SUMMARY (continued)

Other:

There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and non-worker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposures and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Fourth).

PHYSICAL DATA

PROPERTIES OF SELECTED AROCLORS¹

PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g. maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—Not Available

NEV 011389

710641

SPILL, LEAK & DISPOSAL INFORMATION

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any disposal of PCBs, PCB items, or PCB-contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. See Occupational Control Procedures section of this MSDS.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCBs (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

Various federal, state and local regulations may require immediate reporting of PCB spills and may also define spill clean-up levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill clean-up.

ENVIRONMENTAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquids or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

ADDITIONAL COMMENTS

Polychlorinated Biphenyls

For regulatory purposes, under the Toxic Substances Control Act the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance (40 CFR Part 761).

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives.

In 1972 Monsanto restricted sales of PCBs to applications involving only closed electrical systems (transformers and capacitors). In 1977 all manufacturing and sales were voluntarily terminated. In 1979 EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

NEV 011390

710642

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

Monsanto MATERIAL SAFETY DATA

Page 6 of 6

DATE: 10/1/88

SUPERSEDES: All prior to 10/1/88

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

John H. Craddock
Product & Environmental Safety Director

Paul R. Michael
Product & Environmental Safety Manager

Environmental Policy Staff
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63167
(314) 694-4764

Polychlorinated Biphenyls (PCBs)

MATERIAL SAFETY DATA

NEV 011391

Note: Although the information and recommendations set forth (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

710643

MONSANTO PRODUCT NAME

**Polychlorinated
Biphenyls (PCBs)**

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167

Emergency Phone No.
(Call Collect)
314-694-1000

Date: 10/88

PRODUCT IDENTIFICATION

Synonyms: PCBs
Chlorodiphenyl (___% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. ___% Cl)

Trade Names/

Common Names: Aroclor^{®1} Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Therminol^{®1} FR Series

PYRANOL^{®2} and INERTEEN^{®3} are trademarks for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL - Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30-70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

This list of trade names is representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

^{®1} Registered trademark of Monsanto Company

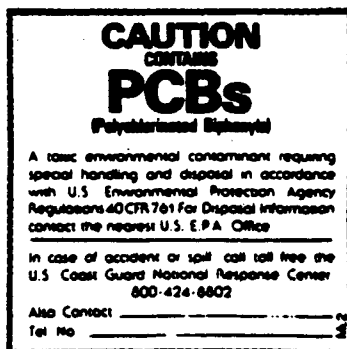
^{®2} Registered trademark of General Electric Company

^{®3} Registered trademark of Westinghouse Electric Corporation

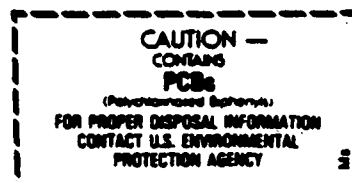
CAS No.'s: 001336363, 053469219, 021672296, 01109769, 011096825 and others

WARNING STATEMENTS

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked. (check regulations, 40 CFR 761, for details)



NEV 016451



715703

MATERIAL SAFETY DATA. Polychlorinated Biphenyls (PCBs)

PRECAUTIONARY MEASURES

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

EMERGENCY AND FIRST AID PROCEDURES

- Ingestion:** Consult a physician. Do not induce vomiting or give any oily laxatives. NOTE TO PHYSICIAN—If large amounts are ingested, gastric lavage is suggested.
- Skin:** If liquid or solid PCBs are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water. NOTE TO PHYSICIAN—Hot PCBs may cause thermal burns.
- Eyes:** Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them. A petrolatum-based ophthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.
- Inhalation:** Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. NOTE TO PHYSICIAN—If electrical equipment arcs over, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

OCCUPATIONAL CONTROL PROCEDURES

- Eye Protection:** Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.
- Skin Protection:** Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.
ATTENTION! Repeated or prolonged contact may cause chloracne in some people.
- Respiratory Protection:** Avoid breathing vapor or mist. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.
- Ventilation:** Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.
- Airborne Exposure Limits:** Chlorinated biphenyl (approximately 42% chlorine)
OSHA PEL: 1 mg/m³ 8-hour time-weighted average - Skin*
ACGIH TLV: 1 mg/m³ 8-hour time-weighted average - Skin*
2 mg/m³ short-term exposure limit - Skin*

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

(OCCUPATIONAL CONTROL PROCEDURES continued on page 3)

Polychlorinated Biphenyls (PCBs)

MATERIAL SAFETY DATA

NEV 016452

715704

OCCUPATIONAL CONTROL PROCEDURES (continued)

Airborne

Exposure Limits (Continued):

Chlorinated biphenyl (approximately 54% chlorine)

OSHA PEL: 0.5 mg/m³ 8-hour time-weighted average - Skin*

ACGIH TLV: 0.5 mg/m³ 8-hour time-weighted average - Skin*

1 mg/m³ short-term exposure limit - Skin*

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

FIRE PROTECTION INFORMATION

Fire and

Explosion:

PCBs are fire-resistant compounds. They may decompose to form CO, CO₂, HCl, phenolics, aldehydes and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

At temperatures in the range of 600-650°C in the presence of excess of oxygen PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

PCBs in electrical equipment have been reported to produce both chlorinated dioxins (PCDDs) and furans (PCDFs) during fire situations. These combustion products may result all, or in part, from non-PCB components of the dielectric fluids or other combusted materials. Consult the equipment manufacturer for information regarding composition of the dielectric fluids in electrical apparatus.

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state, and local regulations.

REACTIVITY DATA

PCBs are very stable, fire-resistant compounds.

HEALTH EFFECTS SUMMARY

Skin Contact:

PCBs can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for contracting chloracne.

Eye Contact:

The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion:

The acute oral toxicities of the undiluted compounds are: LD₅₀ rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation:

Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

(HEALTH EFFECTS SUMMARY continued on page 4)

NEV 016453

715705

MATERIAL SAFETY DATA Polychlorinated biphenyls (PCBs)

HEALTH EFFECTS SUMMARY (continued)

Other:

There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and non-worker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposures and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Fourth).

PHYSICAL DATA

PROPERTIES OF SELECTED AROCLORS*							
PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—Not Available

Polychlorinated Biphenyls (PCBs)

MATERIAL SAFETY DATA

NEV 016454

715706

SPILL, LEAK & DISPOSAL INFORMATION

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any disposal of PCBs, PCB items, or PCB-contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. See Occupational Control Procedures section of this MSDS.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCBs (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

Various federal, state and local regulations may require immediate reporting of PCB spills and may also define spill clean-up levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill clean-up.

ENVIRONMENTAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquids or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

ADDITIONAL COMMENTS

Polychlorinated Biphenyls

For regulatory purposes, under the Toxic Substances Control Act the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance (40 CFR Part 761).

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives.

In 1972 Monsanto restricted sales of PCBs to applications involving only closed electrical systems (transformers and capacitors). In 1977 all manufacturing and sales were voluntarily terminated. In 1979 EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

NEV 016455

715707

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

DATE: Issued 10/1/88 - reprinted - 10-92**SUPERSEDES:** All prior to 10/1/88**FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:**

John H. Craddock
Product & Environmental Safety Director

Gary W. Mappes
Product & Environmental Safety Manager

Environmental Policy Staff
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63167
(314) 694-4764

Polychlorinated Biphenyls (PCBs)

MATERIAL SAFETY DATA

NEV 016456

Note: Although the information and recommendations set forth (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.